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TITLE

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METHOD AND APPARATUS FOR BROWSING
USING POSITION INFORMATION

FIELD OF THE INVENTION

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The present invention pertains generally to the field of computer systems. More particularly, the invention relates to using Global Positioning System (GPS) type coordinate information to search and locate information accessible through a computer network.

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BACKGROUND OF THE INVENTION

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As computer innovation sweeps across the business and personal consumer markets, the Internet is growing in an exponential rate. It is estimated that over 30 million people worldwide use the Internet with 100 million predicted to be on the "net" within a few years.

The Internet is a network of computers and other devices linked together by various media, enabling all the computers to exchange and share data. Data may be transferred using a communication protocol such as Transmission Control

5 Protocol/Internet Protocol (TCP/IP). The Internet can provide information about a myriad of corporations, products, as well as educational, science, technology, research, business, entertainment information and services. Computers that initiate requests for information (i.e., service) are referred to as

10 "clients", and computers that respond to service requests are referred to as "servers." Hypertext Transfer Protocol (HTTP) is typically used to facilitate communication between clients and servers.

One important structure of the Internet is the World Wide

15 Web ("web"). The web is a collection of information formatted as hypertext-based documents (i.e., web pages). A related set of web pages or documents maintained by a single web server is often referred to a web site. This information can be distributed through computers around the world connected to the Internet. Web

20 pages are basically a computer data file on a host operating as a web server within a given domain name (e.g., TV.com). The web server receives inquiries from clients (i.e., other computers) via the Internet and downloads the web page data in the file to the client making the inquiry. The web page may comprise multiple

25 pages of information including messages, audio and graphical information, and combinations thereof.

The web pages are written using a programming language called Hypertext Markup Language (HTML). Other hypertext programming languages may also be used to create the hypertext documents such as Dynamic HTML (DHTML), eXtensible Markup Language (XML), Synchronized Multimedia Integration Language (SMIL). Generally, HTML commands, i.e., tags, provide functions for defining the layout/format of the web page, embedding sound and images in the web page and adding links (i.e., hyperlinks) to other web pages or web sites. These links allow the user to select a word, phrase or image (referred to as a "hypertext anchor") to go to, or receive information from, a web site which may be located on a remote server.

Navigation tools, such as network browsers, are typically used by clients to access, process and display a web page. Examples of well-known browsers are Netscape and Internet Explorer. These browsers provide a set of instructions or commands that correspond to tags available in HTML. The browsers compare tags found embedded in the web page and execute the procedures corresponding to the matched browser command.

Hyperlinks, as discussed above, are typically identified as character strings, such as a Uniform Resource Locator (URL) (i.e., an address to the web page). If the URL of the web page is not known, search engines allow users to search for web pages. Access to the search engines is provided via the browsers. Well-known conventional search engines include, for example, Searches, Yahoo!, Excite and Alta Vista. These search engines accept search criteria based on a "search text" from the client and search for web

documents that match the search criteria.

The search text typically consists of one or more descriptive words related to the subject matter to be found on the web page. For example, to locate a web page relating to audio compact disk (CD) players manufactured by XYZ Corporation, the search text may be: "XYZ AND audio AND CD." The search engines would then display results ("hits") based upon this search criteria (i.e., the URL of, or hyperlink to, web pages containing these words).

One problem with these conventional search engines is that the results obtained using these search texts generally have no relation to geographic position. For example, the web page hits maybe related to businesses and services located around the United States or the world. However, the client initiating the search may only be interested in locating web pages (e.g., from businesses) within a specific geographic area. This would be particularly advantageous to a client located in that geographic area or possibly moving to that area.

U.S. Patent 5,852,810 describes a system for listing and locating housing in specific geographic regions. The system includes a web home page and a housing information database. A map is displayed when the web home page is accessed by a user. The user narrows searches to geographic areas by selecting specific areas of interest on the map. Housing information related to the area of interest is then displayed for the user.

The information contained within the database, however, is merely a collection of data submitted by property managers. This information is like a real estate listing for a geographic area, i.e., similar to the yellow page directory for businesses within an area. In addition, all of the administration and updating of the database must be performed by the property managers.

This system, however, is not a web page search engine. It does not allow a user to locate web pages using geographic coordinates. The searchable information is limited to the information contained in the database -- rather than the universe of information available on the web. In addition, this system is hampered by the need to be administered and maintained by the property managers.

Conventional search engines also have features similar to business directories. These search engines maintain databases containing list of businesses. A user may enter his home address, for example, and receive a list of businesses in the vicinity of the user's home address. These business directory features, however, suffer many of the same shortcomings discussed above.

One of the principle advantages of the web is that anyone (e.g., a small business) can create a web page that is "locatable" by a client (e.g., a consumer) on the web. There is no requirement to register the web page in a proprietary list, or submit the web page to a controlled database, to be accessible on the web.

With the tremendous growth of the Internet, the web is a valuable resource of information and business tool. A well-

crafted web page, for example, can spark both e-commerce and local
"walk-in" business for a business entity. To generate "walk-in"
type business, a web page should be in someway linked to, and
locatable based upon, geographic information. This will allow
5 users to find web pages within or near a geographic area.

There thus exists in the art a need for improved systems
and method for searching the web using searches based upon
geographic coordinate-type information. It is also desirable to
provide servers capable of facilitating access to web pages
10 created using geographic coordinate-type information.

BRIEF SUMMARY OF THE INVENTION

15 It is an object of the present invention to address the
limitations of the conventional search engines and browsers
discussed above.

Generally, embodiments of the present invention are
directed to browsing techniques that use geographic coordinates.
20 This enables clients to locate hypertext documents such as web
pages of services, companies and shops near a particular area that
maybe near their residence or business location. The web pages
have position information associated therewith to facilitate
searching.

25 In one aspect of the present invention, a server for
providing information, which is accessible through a computer
network, includes a controller including an interface to the

computer network and a graphical mapping system capable of
generating a map of a geographic area for transmission through the
interface. A search engine is configured to locate hypertext
documents in accordance with a request received through the
5 interface. The request includes search criteria based on
geographic position information.

In another aspect of the invention, a machine-readable
storage medium including program codes, which upon execution,
cause a machine to receive search criteria based upon a geographic
10 position and to search for world wide web pages in accordance with
the search criteria.

One advantageous embodiment of the invention relates to
the creation of hypertext documents that are created using
geographic position information. For example, the name of a world
15 wide web page is based on longitude and latitude coordinates.
This allows a search engine in accordance with another embodiment
of the invention to quickly locate the web page. In another
embodiment, the search engine may also use an index containing
correlated position and web page information.

20 These and other embodiments and aspects of the present
invention are exemplified in the following detailed disclosure.

BRIEF DESCRIPTION OF DRAWINGS

The features and advantages of the present invention can be understood by reference to the detailed description of the preferred embodiments set forth below taken with the drawings, in which:

Fig. 1 is a block diagram of a client/server network in accordance with one aspect of the present invention.

Fig. 2 is a block diagram of a client computer system.

10 Fig. 3 is a block diagram showing different functions and features of the client/server system in accordance with another aspect of the invention.

Fig. 4 is a flow chart of a method in accordance with a preferred embodiment of the invention.

15 Fig. 5 is a data flow diagram of a client/server network in accordance with a preferred embodiment of the invention.

Figs. 6-8 are geographic maps in accordance with yet another aspect of the invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Referring now to Fig. 1, a network configuration is illustrated including a client 10 and a GPS-server 40. The client 10 is connected to the GPS-server 40 via Internet 30 and an Internet Service Provider (ISP) 20. Of course, the invention is not limited to this type of network configuration, other network configurations such as an Intranet may be used.

Figure 2 is a block diagram of the client 10. The client 10 includes a CPU 11, which performs the processing functions, a random access memory 12 (RAM), a read only memory 13 (ROM) and mass storage 14. The ROM 13 is used to store at least some of the program instructions that are to be executed by the CPU 11, such as portions of the operating system or basic input-output system (BIOS), and the RAM 12 is used for temporary storage of data. The mass storage 14 may be any conventional non-volatile device capable of storing large volumes of data, such as a magnetic or optical disk or tape.

The client 10 also includes a communication port 15 suitable for connection to the ISP 20. The communication port 15 enables the CPU 11 to communicate with external devices on the Internet 30 via the ISP 20. For example, a conventional modem (not shown) and a dedicated telephone line for establishing communication with the ISP 20 may be used. Other data network interfaces, however, may be used such as a cable television modem, or an Integrated Services Digital Network (ISDN) adapter.

A display device 16, a keyboard 17 and a pointing device

18 are included in the client 10. The display device 16 may be any visual display device such as a Cathode Ray Tube (CRT) or a Liquid Crystal Display (LCD). The pointing device 18 may be any conventional device for moving a cursor or pointer on the display device, such as a trackball, mouse or stylus.

The client 10 also includes a browser 19. In one embodiment, the browser 19 is implemented by execution of a sequences of instructions that cause the CPU 11 to perform steps according to the invention. For example, the instructions may be contained in the RAM 12 or mass storage 14 or be loaded from a remote device via the Internet 30. The downloaded instructions may be directly executed by the CPU 11 or stored in memory.

Figure 3 shows various features and functions of the browser 19 and the GPS-server 40. In this embodiment, the GPS-server 40 includes a controller 41, a dynamic map program 42, coordinate data 43 and a search engine 44. The controller 41 provides a conventional interface with the Internet 30 and allows the GPS-server 40 to communicate with the client 10. The controller 41 may have the same hardware architecture as shown in Fig. 2 for the client 10.

The dynamic map program 42 and the search engine 44 are based on software that are executed by the controller 41 within the GPS-server 40. In other embodiments, hardware circuitry may be used in place of, or in combination with, software instructions to implement the invention.

The dynamic map program 42 may be any conventional graphics utility that can generate a geographic map. The dynamic

map program 42 is capable of expanding or narrowing the geographic area being displayed. A geographic database 46 may be included in the dynamic map program 42 or such data may be received/downloaded from other sources such as a CD ROM or via the Internet 30 as needed.

Figures 6-8 show digital images produced by the dynamic map program 42. As shown in Fig. 6, a map of the northeast coast of the United States is displayed. Figure 7 shows a "zoomed" version of the northeast coast focused around the state of New Jersey. Figure 8 show an even further "zoomed" version which is focused on a portion of northern New Jersey. The level of detail, i.e., individual city names or street names, may be modified as desired. Other information such as landmarks, historical cites, businesses, parks, hospitals, and government buildings may also be displayed.

The coordinate data 43 is a database of position information correlated to the map produced by the dynamic map program. The position information includes latitude and longitude coordinates for various points on the map generated by the dynamic map program 42. In addition, position information relating to web pages is included as discussed further below. Coordinate/position information may be updated/received from a GPS receiver/database 45.

In one embodiment, the GPS receiver/database 45 gathers information from one or more GPS receivers that are used to maintain a database of coordinate information. The Global Positioning System (GPS) is a radio navigational aid using

multiple satellites in high orbit around the earth with position fixes determined by range and range-rate measurements. GPS provides extremely accurate position and velocity information to users around the world. Satellites, maintained by the U.S.

5 government, transmit coded radio frequency (RF) signals to earth-based GPS receivers. Highly accurate (within several meters) position determinations (i.e., longitude and latitude coordinates) are based on measurements of propagation times of the RF signals from the satellites.

10 In a preferred embodiment, web pages are created/designed using GPS-type coordinate data. The accuracy of the GPS system provides for unique information to be associated with each web page. For example, a company located at latitude 740000 and longitude 720000 may create a web page with a name such as
15 1o7400001a720000.html, 1a7400001o720000.html, 7400001-720000.html, or the like. The coordinate/position information is preferably obtained using a GPS receiver. Of course, the coordinate/position information can be obtained from other sources such as a CD ROM or via the Internet 30.

20 In another embodiment, the web pages need not be created with names based upon latitude and longitude information. The coordinate data 43 may include a link index pointing to different web pages based on coordinate information as in the shown in the example below.

25 Index array:

740000, 720000---→ www.sample-1.com/MyShop.html

740002, 720001---→ www.sample-2.com/MyCompany.html

Alternatively, the web page may include the position information as background information in a HTML tag (i.e., a metatag), which is accessible by the search engine 44. In this embodiment, the search engine 44 extracts the position information from the web page so that the web page can be located based on GPS-type position information. As discussed above, the web pages themselves are created using, or include, position/coordinate information.

In practice, a third-party, interested in setting up a position-based web page may obtain position coordinates using a GPS system. The position coordinates may be for the party's business address, residence or server location, for example. A web page is then created/designed using the location coordinates thus obtained. Preferably the web page name has the following format: loXXXlaYYY.html. The XXX following "lo" represents the longitude coordinate. The YYY following the "la" represents the latitude coordinate. Of course, other formats, as discussed above, can also used.

The web page is then made available on a server or search engine, e.g., the GPS-server 40, attached to the Internet 30 using a conventional protocol. Alternatively, and depending on the GPS-server 40, the third party can register an index value comprising a latitude and longitude value that points to the desired web page. This allows an existing web site to be associated with position information.

Figure 4 is a flow diagram showing steps for searching for web pages based on position information. In step S100 the client 10 connects to the GPS-server 40 through the Internet 30 using the browser 19. The client 10 can access the GPS-server 40, for example, by specifying the URL of the GPS-server 40 (e.g., www.gps-sever.com). The browser 19 then receives and displays a global map of world (see, e.g., Figs. 6-8) which includes latitudes and longitude coordinate data in step S200. The latitudes and longitude coordinates, however, may or not be displayed depending on the preference of the client 10. Initially, a default map may be displayed or the client 10 may select a map of a particular geographic region. The default map may be based on the geographic position automatically received from the client 10, if such information is available from the client 10.

As shown in Fig. 3, the browser 19 includes Graphical User Interface (GUI) and map control routines for processing the received map from the GPS-server 40 in a dynamic manner. As discussed above, the displayed map may be "zoomed" in or out to display more or less detail.

In step S300, search criteria are entered by the client 10. A specific point on the map may be designated by selecting a point using the pointing device 18 or typing the name of a location using the keyboard 17. For example, the client 10 may navigate to a specific location using a computer mouse and click on the point to indicate a selection. The position coordinates of the selected point are translated and used by the GPS-server 40 to

perform the search.

It should also be noted that other search criteria may also be entered, for example:

- all web pages within a specified radius of a designated point;
- all web pages within a specified radius which belong to a specific category such as grocery stores, toy stores or department stores;
- all web pages within a designated state or city;
- all web pages above or below a certain latitude;
- all web pages within a designated area (e.g., a triangle or square drawn on the map);
- all web pages within a first designated area excluding all web pages within a second designated area; and
- locate a web page having an entered latitude and longitude.

The GPS-server 40 then implements a search in accordance with the entered search criteria, e.g., latitude and longitude values. In step S400, the GPS-server 40 provides the client 10 with the search results. The search engine 44 executes the search by obtaining the position information related to a web page from (1) the html page names, (2) searching the index list of latitudes and longitudes, or (3) extracting and analyzing the background position information associated with the web page.

The search result may be provided as a list of hypertext

documents or thumbnail icon images representing each of the
hypertext documents that fall within the specified geographic
region. The browser 19 then displays the list or thumbnail icons
at their respective coordinates on the display map. Brief
5 descriptions of the hypertext documents may be included to
identify the them. In step S500, a particular hypertext document
is selected, e.g., by double clicking on a chosen icon. The GPS-
server 40 then downloads, in step S600, the hypertext document
corresponding to the selected icon to the client 10.

10 Figure 5 illustrates the typical data flow between the
client 10 and the GPS-server 40. The data flow/exchange
substantially corresponds to the description given above in
relation to Fig. 4.

The client 10 can thus browse the Internet 30 using
15 mapping/position coordinates. Since each web page generated for
any location is unique, the client 10 need not know the web site
name or URL (i.e., address path). All that is needed to search is
the geographic location information which is directly
obtained/selectable using the displayed map.

20 In another embodiment, reverse position searches may be
performed. Illustratively, the client 10 may have an approximate
position based upon the position of a landmark, building, address
or proximity to a web page based upon geographic information. For
example, the Client 10 may have performed a geographic search and
25 determined that a web page from a department store is nearby. The
client 10 then requests the GPS-server 40 to determine the
position of the client 10 based upon information obtained from the

department store web page. This allows the client 10 to receive GPS-based position information from a web site or the GPS-server 40 to determine the geographic position of the client 10.

In addition, a mobile client system (e.g., a laptop
5 computer) may determine highly accurate position information based on position information received from the GPS-server 40 or located web sites. Triangulation or navigation software (e.g., as used with automobile navigation systems) may be used to facilitate determination of the exact geographic position. Also navigation
10 software such as Philips car-in can connect to web sites that are near the current location using position information received from a GPS receiver.

While the present invention has been described above in terms of specific embodiments, it is to be understood that the
15 invention is not intended to be confined or limited to the embodiments disclosed herein. On the contrary, the present invention is intended to cover various structures and modifications thereof included within the spirit and scope of the appended claims.